

DATE: May 6, 2005

TO: Region Engineers
Region Delivery Engineers
TSC Managers
Resident/Project Engineers
Region Construction Engineers

FROM: Larry E. Tibbits
Chief Operations Officer

John C. Friend
Engineer of Delivery

SUBJECT: Bureau of Highway Instructional Memorandum 2005-06
Testing Requirements for Capital Preventive Maintenance
Hot Mix Asphalt Projects

This memorandum applies to all Capital Preventive Maintenance (CPM) hot mix asphalt (HMA) one course overlay projects for the 2005 construction season, including one course mill and resurface projects.

To correct a situation where HMA tonnage was inadvertently accepted on CPM projects with neither acceptance testing nor a performance warranty, the following revision is being put into place. This revision affects projects using frequently used special provisions 03SP502(A) and/or 03SP502(Q).

One of two approaches will be used for acceptance. The department will base its acceptance on either receiving a performance warranty from the contractor or via acceptance testing of hot-mix tonnage. Depending upon how the original CPM contract was set up, one of the following four scenarios will apply:

1. If the project proposal contains frequently used special provision 03SP502(A) and/or 03SP502(Q), has no HMA testing set up on the project, and the total tonnage on the project exceeds 2000 tons, the contractor will have the option of switching to the applicable performance warranty special provision:
 - Special Provision for Pavement Performance Warranty One Course Hot Mix Asphalt Overlay (Preventive Maintenance)
 - Special Provision for Pavement Performance Warranty Coldmilling & One Course Hot Mix Asphalt Overlay (Preventive Maintenance)

Or MDOT will perform quality assurance testing per the applicable special provision:

- Special Provision for Furnishing And Placing One Course Marshall Hot Mix Asphalt Overlay (Capital Preventive Maintenance) for Marshall mixes
 - Special Provision for Furnishing And Placing One Course Superpave Hot Mix Asphalt Overlay (Capital Preventive Maintenance) for Superpave Mixes
2. If the project proposal contains frequently used special provision 03SP502(A) and/or 03SP502(Q), has no HMA testing set up on the project, and the total tonnage on the project is less than 2000 tons, the contractor will have the option of switching to the applicable performance warranty special provision:
- Special Provision for Pavement Performance Warranty One Course Hot Mix Asphalt Overlay (Preventive Maintenance)
 - Special Provision for Pavement Performance Warranty Coldmilling & One Course Hot Mix Asphalt Overlay (Preventive Maintenance)

Or MDOT will perform QA testing per Section 504.01C of the 2003 Standard Specifications for Construction.

3. If the project proposal contains frequently used special provision 03SP502(A) and/or 03SP502(Q) and has partial HMA testing set up on the project, the contractor will have the option of switching to the applicable performance warranty special provision:
- Special Provision for Pavement Performance Warranty One Course Hot Mix Asphalt Overlay (Preventive Maintenance)
 - Special Provision for Pavement Performance Warranty Coldmilling & One Course Hot Mix Asphalt Overlay (Preventive Maintenance)

Or MDOT will perform quality assurance testing on the portion of the job where testing is not set up per the applicable special provision:

- Special Provision for Furnishing And Placing One Course Marshall Hot Mix Asphalt Overlay (Capital Preventive Maintenance) for Marshall Mixes
 - Special Provision for Furnishing And Placing One Course Superpave Hot Mix Asphalt Overlay (Capital Preventive Maintenance) for Superpave Mixes.
4. If the project proposal contains frequently used special provision 03SP502(A) and/or 03SP502(Q) and has HMA testing set up for the entire job, no action is needed.

In any instances where the Special Provision for Furnishing And Placing One Course Marshall Hot Mix Asphalt Overlay (Capital Preventive Maintenance) or the Special Provision for Furnishing And Placing One Course Superpave Hot Mix Asphalt Overlay (Capital Preventive Maintenance) is added to the contract, the contractor is required to provide cores to the department and will be compensated as outlined in Section 103.04 of the 2003 Standard Specifications for Construction.

If you have any questions regarding this instructional memorandum, please contact Kevin Kennedy, Capital Preventive Maintenance Engineer, at kennedyk@michigan.gov or 517-322-6043.

Chief Operations Officer

Engineer of Delivery

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BOHD:C/T:KPK:kab

Attachments

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	J. Culp	B. O'Brien	MITA	
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MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**PAVEMENT PERFORMANCE WARRANTY
ONE COURSE HOT MIX ASPHALT OVERLAY
(Preventive Maintenance)**

C&T:KPK

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APPR:C&T:CJB:JWB:03-29-05

a. Description. The pavement performance warranty shall consist of satisfying the warranty requirements of the work contained in the appendices. This special provision establishes the common terms and definitions applied to the pavement requiring warranted work. The Pavement Performance Warranty assures and protects the Department from specific defects found in the pavement.

b. Definitions.

1. Acceptance Date of Warranted Work - The date when the warranted work is complete and has been determined by the Department to be in compliance with the contract specifications and is continuously open to traffic. This is the date of initial acceptance and constitutes the start date for the warranty period. There may be more than one acceptance date of warranted work for a project.
2. Warranty Bond - A bond issued by a surety which guarantees that the warranty requirements will be met.
3. Warranty Lane(s) - The portion of the pavement considered warranted work. Each of the following is considered a separate warranty lane.
 - Each individual mainline lane and adjacent shoulder
 - The sum of all ramp lanes and the associated acceleration/deceleration lanes
 - The sum of all auxiliary lanes, such as passing lanes and turn lanes

Approaches and driveways are not considered warranty lanes for the purpose of this provision.

4. Warranted Work- Work that is guaranteed to meet the warranty requirements throughout the warranty period.
5. Warranty Work - Corrective action taken by the Contractor to bring the warranted work into contract compliance. All costs will be borne by the Contractor including traffic control, mobilization, pavement marking and/or other work.

c. Initial Acceptance. The Department and the Contractor shall jointly review all completed warranted work, or a portion thereof, as determined by the Department. If the work does not meet contract requirements, the Contractor shall make all necessary corrections, at their expense, prior to initial acceptance. Initial acceptance will occur as soon as the

Department determines that all contract requirements have been met for the warranted work. The date on which initial acceptance occurs is termed the Acceptance Date of Warranted Work.

Initial acceptance will be documented and executed jointly by the Department and the Contractor on a form furnished by the Department. A copy of the form will be sent to the Contractor's warranty bond surety agent by the Department. Neither the initial acceptance nor any prior inspection, acceptance or approval by the Department diminishes the Contractor's responsibility under this warranty.

The Department may accept the work and begin the warranty period, excluding any area needing corrective work, to accommodate seasonal limitations or staged construction.

d. Warranty Bond. The Contractor shall furnish a single term warranty bond, in an amount stipulated in the appendix, prior to contract award. The effective starting date of the warranty bond shall be the Acceptance Date of Warranted Work. The warranty bond will be released at the end of the warranty period or after all warranty work has been satisfactorily completed, whichever is latest.

e. Rights and Responsibilities of the Department. The Department:

1. Reserves the right to approve the time, traffic control and methods for performing any warranty work by permit through the Region utilities and permit process.
2. Reserves the right to approve the schedule proposed by the Contractor to perform warranty work.
3. Reserves the right to approve all materials and specifications used in warranty work.
4. Reserves the right to determine if warranty work performed by the Contractor meets the contract specifications.
5. Reserves the right to perform, or have performed, routine maintenance during the warranty period, which routine maintenance will not diminish the Contractor's responsibility under the warranty.
6. Reserves the right, if the Contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition caused by defective warranted work as determined by the Department. The department will attempt to notify the contractor that action is required to address an unsafe condition. The Department will record the time and date of attempts for Contractor Notification. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the Contractor.

7. Is responsible for monitoring the pavement throughout the warranty period and will provide the Contractor all written reports of the surface treatment's condition and/or maintenance activities related to pavement performance when requested.
8. Is responsible for notifying the Contractor, in writing, of any corrective action required to meet the warranty requirements.

f. Rights and Responsibilities of the Contractor. The Contractor:

1. Shall warrant to the Department that the warranted work will be free of defects as measured by the performance parameters and specified threshold values for each. The warranty bond shall be described on a form furnished by the Department. The completed form shall be submitted to the Department prior to award of contract.
2. Is responsible for performing all warranty work including, but not limited to, maintaining traffic and restoring all associated pavement features, at the Contractor's expense.
3. Is responsible for performing all temporary or emergency repairs, resulting from being in non-compliance with the warranty requirements, using Department approved materials and methods.
4. Shall notify the Department and submit a written course of action for performing the needed warranty work a minimum of ten calendar days prior to commencement of warranty work, except in the case of emergency repairs as detailed in this special provision. The submittal must propose a schedule for performing the warranty work and the materials and methods to be used.
5. Shall follow a Department approved maintaining traffic plan when performing warranty work. All warranty work shall be performed under permit issued by the Region Utilities & Permits Engineer. The permit fee and an individual permit performance bond shall not be required. The permit insurance requirements, however, shall apply.
6. May be responsible for reimbursing the Department a portion of any incentive payments paid to the Contractor for early completion of the original work. Reimbursements will be required if the proposed maintaining traffic plan for corrective action requires lane closures during peak hour traffic. Peak hours will be determined by the Region Traffic and Safety Engineer. The daily reimbursement amount shall not exceed twenty five percent of the original daily earned incentive payment. The Department shall determine the actual percentage on a project by project basis.
7. Shall furnish to the Department, in addition to the regular performance and lien bond for the contract, supplemental performance and lien bonds covering any warranty work being performed. These supplemental bonds shall be furnished prior to beginning any warranty work, using Department approved forms. These supplemental bonds shall be in the amount required by the Department to cover the costs of warranty work.
8. Shall complete all warranty work prior to conclusion of the warranty period, or as otherwise agreed to by the Department.

9. Shall be liable during the warranty period in the same manner as Contractors currently are liable for their construction related activities with the Department pursuant to the Interim 2003 Standard Specifications for Construction, including, but not limited to subsections 103.06, 107.10 and 107.11. This liability shall arise and continue only during the period when the Contractor is performing warranty work. This liability is in addition to the Contractor performing and/or paying for any required warranty work, and shall include liability for injuries and/or damages and any expenses resulting therefrom which are not attributable to normal wear and tear of traffic and weather, but are due to non-compliant materials, faulty workmanship, and to the operations of the Contractor as set forth more fully in subsections 103.06, 107.10 and 107.11 of the Interim 2003 Standard Specifications for Construction.

g. Evaluation Method. The Department will conduct pavement evaluations by dividing the project into segments. Each individual driving lane will be divided into segments of 528 feet (1/10 mile) in length for measuring and quantifying the condition parameters. Evaluation will include use of both the Department's Pavement Management System and/or field pavement condition reviews. This evaluation may be waived in emergency situations.

The beginning point for laying out segments will be the Point of Beginning (POB) of the project. Segments will be laid out consecutively to the Point of Ending (POE) of the project. The original segmentation of the project will be used for all successive reviews throughout the warranty period.

h. Warranty Requirements. Warranty work will be required when the following two criteria are met as a result of a failure to meet the performance parameters.

Criterion 1 -The threshold limit for a performance parameter is exceeded, and

Criterion 2 - The maximum allowable number of defective segments is exceeded for one or more condition parameters for a warranty lane, unless otherwise noted in the appendices.

Specific threshold limits and segment limits are covered in the appendix.

During the warranty period, the Contractor will not be held responsible for pavement distresses that are caused by factors beyond his control. These include, but are not limited to: chemical and fuel spills, vehicle fires, snow plowing, and testing by the Department, such as coring. Other factors considered to be beyond the control of the Contractor which may contribute to pavement distress will be considered by the Engineer on a case by case basis upon receipt of a written request from the Contractor.

i. Conflict Resolution Team. The sole responsibility of the Conflict Resolution Team (CRT) is to provide a decision on disputes between the Department and the Contractor regarding application or fulfillment of the warranty requirements. The CRT will consist of five members:

- Two members selected, and compensated by the Department.
- Two members selected and compensated by the Contractor.
- One member mutually selected by the Department and the Contractor. Compensation for the third party member will be equally shared by the Department and the Contractor.

If a dispute arises on the application or fulfillment of the terms of this warranty, either party may serve written notice that appointment of a CRT is required.

At least three members of the CRT must vote in favor of a motion to make a decision. The CRT may decide to conduct a forensic investigation, will determine the scope of work and select the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Contractor and the Department based on the determined cause of the condition.

j. Emergency Repairs. If the Department determines that emergency repairs are necessary for public safety, the Department or its agent may take repair action. Emergency repairs must be authorized by the Region Engineer.

Prior to emergency repairs, the Department will document the basis for the emergency action. In addition, the Department will preserve evidence of the defective condition.

k. Non-extension of Contract. This Special Provision shall not be construed as extending or otherwise affecting the claim process and statute of limitation applicable to this Contract.

l. Measurement and Payment. All costs, including engineering and maintaining traffic costs, associated with meeting the requirements of this special provision are considered to be included in the Contract unit prices for the warranted work items regardless of when such costs are incurred throughout the warranty period. These costs include but are not limited to, all materials, labor and equipment necessary to complete required warranty work.

**MATERIALS & WORKMANSHIP WARRANTY APPENDIX FOR
ONE COURSE HOT MIX ASPHALT OVERLAY**

- A1. Application.** This appendix applies to pavement warranties for 1 ½ inch preventive maintenance HMA overlays.
- A2. Limits of Warranted Work.** The warranted work includes all hot mix asphalt on warranty lanes within the project limits unless otherwise indicated on the plans.
- A3. Warranty Term.** The warranty term will be three years from the date of Initial Acceptance otherwise termed the Acceptance Date of Warranted Work.
- A4. Warranty Bond.** The bond will equal 100% of the contract cost for the warranted work.
- A5. Initial Ride Quality Acceptance Criteria.** The Department will measure the ride quality prior to placement of the HMA overlay. Subsequent to placement of the overlay, the Department will also measure the pavement ride quality. Both measurements will be expressed in terms of the Michigan Ride Quality Index (RQI). Ride quality measurements will be conducted and evaluated separately for each warranty lane. Shoulder work is exempt from the ride quality measures.

The pavement ride quality, for each warranty lane, must meet the following criteria subsequent to the HMA overlay,

- 1) If the pre-overlay RQI is less than 70, then the post-overlay RQI must be less than 53.
- 2) If the pre-overlay RQI exceeded 70, then the post-overlay RQI must not be greater than 80% of the pre-overlay RQI.
- 3) All individual tenth mile segments must have RQI values that are equal or lower than the corresponding value prior to the overlay.

- A6. Condition Parameters.** Condition parameters are used to measure the performance of the HMA pavement during the warranty term. Each condition parameter has a threshold level applied to each segment and a maximum number of defective segments allowed before corrective action (warranty work) is required.

Definitions

Longitudinal Crack/Open Joint - A crack or open joint, at least five feet in length, that is oriented primarily in the longitudinal direction versus the transverse direction. That is, the angle between the overall crack line and the centerline is less than 45 degrees. It can exist anywhere in the driving lane; i.e., at the pavement centerline joint, wheel path, center of lane, or lane/shoulder joint. This does not include reflective cracking from underlying pavement.

De-bonding - A physical separation of two HMA layers. De-bonding will be visually identified as shoving, or the loss of the new surface course. Surface potholes, regardless of depth, will be classified as de-bonding.

Raveling - Surface disintegration, due to the loss of coarse or fine aggregate material, that occurs over an area or in a continuous longitudinal strip.

Flushing - The accumulation of excess asphalt binder on the pavement surface that creates a shiny, reflective condition and becomes tacky to the touch at high temperatures.

Rutting - A longitudinal surface depression in the wheel path. It may have associated transverse displacement or humping.

- A7. Warranty Requirements.** Table 1 lists the allowable threshold limit for each condition parameter within each segment and the maximum number of allowable segments within a warranty lane for each condition parameter. If the threshold is exceeded for a condition parameter, for more than the maximum number of allowable segments, corrective action (warranty work) is required.

The defective segments for surface distress may or may not be contiguous to necessitate corrective action. The maximum allowable number of defective segments for each condition parameter applies to each warranty lane in each travel direction. Each warranty lane shall be evaluated independent of adjacent warranty lanes. Any pavement surface requiring removal/replacement to correct deficiencies, for any condition parameter, shall be replaced full-width across the warranty lane.

TABLE 1 - WARRANTY REQUIREMENTS FOR ONE COURSE HMA OVERLAY

CONDITION PARAMETER	THRESHOLD LIMITS PER SEGMENT (Length = 528 feet)	MAX. DEFECTIVE SEGMENTS (1)
Longitudinal Cracking/ Open Joint	25% of segment length	4
De-bonding ⁽⁴⁾	25% of segment length	2
Raveling	20% of segment length	4
Flushing	5% of segment length	2
Rutting ⁽³⁾⁽⁴⁾	ave. rut depth = 1/4 inch ⁽²⁾	1
<p>1 The maximum allowable number of defective segments per warranty lane is determined by multiplying by the length of the specific warranty lane in miles.</p> <p>2 The rut depth threshold applies to each wheel path independently.</p> <p>3 The pavement surface will be evaluated for the presence of rutting on each warranty lane throughout the warranty period. The pavement surface will be measured beginning at the POB and every 132 feet thereafter to determine average rut depth to quantify rutting for a particular segment.</p> <p>Rut measurements will be done using a straight rigid device that is a minimum of 7 feet long and of sufficient stiffness that it will not deflect from its own weight, or a wire under sufficient tension to prevent sag when extended 7 feet. Measurements will be taken by placing this "straightedge" across the pavement surface perpendicular to the direction of travel. The straightedge shall contact the surface on at least two bearing points with one located on either side of the rut. The straightedge is properly located when sliding the straightedge along its axis does not change the location of the contact points. Rut depth is then measured at the point of greatest perpendicular distance from the bottom of the straightedge to the pavement surface.</p> <p>4 Does not apply to shoulder.</p>		

- A8. Corrective Actions.-** The Contractor will propose corrective action subject to Department approval. The Department will accept the proposed corrective action if the action will correctly restore both the original preventive maintenance treatment and the benefit that the treatment provides to the underlying pavement structure.

**MICHIGAN DEPARTMENT OF TRANSPORTATION
INITIAL ACCEPTANCE
FOR
PAVEMENT WARRANTY**

CONTRACT ID: _____	
CONTROL SECTION: _____	JOB NUMBER: _____
SURETY NAME _____	
SURETY ADDRESS: _____	
CONTRACTOR NAME: _____	
CONTRACTOR ADDRESS: _____	

<i>IDENTIFY EACH JOB NUMBER, LOCATION AND WORK SEPARATELY</i>					
JOB NUMBER	ROUTE NUMBER	CONTROL SECTION	WORK TYPE	DATE ACCEPTED	PROJECT ENGINEER

INITIAL ACCEPTANCE OF WARRANTY WORK APPROVAL	
CONTRACTOR'S SIGNATURE: _____	
ENGINEER'S SIGNATURE: _____	
ACCEPTANCE DATE: _____	

**MICHIGAN
DEPARTMENT OF TRANSPORTATION
PAVEMENT WARRANTY BOND**

Bond Number _____

KNOWN ALL MEN BY THESE PRESENTS:

That we, _____ (hereinafter called the "Principal"), and _____, a corporation duly organized under the laws of the State of _____ and duly licensed to transact business in the State of Michigan (hereinafter called "Surety"), are held and firmly bound unto the Michigan Department of Transportation (hereinafter called the "Obligee"), in the sum of _____ Dollars (\$), for the payment of which sum well and truly to be made, we, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has heretofore entered into a contract with the Michigan Department of Transportation dated _____ under Contract ID _____ and;

WHEREAS, the said Principal is required to guarantee the _____ installed under said contract, against specific pavement defects which may develop during the period(s) of years beginning the date(s) of the Acceptance Date of Construction by the Obligee.

In no event shall losses paid under this bond aggregate more than the amount of the bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal shall faithfully carry out and perform the said guarantee, and shall, on due notice, repair and make good at its own expense any and all specific pavement defects in the said work which may develop during the period specified above or shall pay over, make good and reimburse to the said Obligee all loss and damage which said Obligee may sustain by reason of failure or default of said Principal so to do, then this obligation shall be null and void; otherwise shall remain in full force and effect.

PROVIDED HOWEVER, that in the event of any default on the part of said Principal, a written statement of the particular facts showing such default and the date thereof shall be delivered to the Surety by registered mail, within thirty (30) days after the Obligee or his representative shall learn of such default and that no claim, suit or action by reason of any default of the Principal shall be brought hereunder after the expiration of thirty (30) days from the end of the warranty period as herein set forth.

Signed this _____ day of _____, _____.

Contractor

_____By

_____Surety

_____By

Attorney-In-Fact

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**PAVEMENT PERFORMANCE WARRANTY
COLDMILLING & ONE COURSE HOT MIX ASPHALT OVERLAY
(Preventive Maintenance)**

C&T:KPK

1 of 10

C&T:APPR:CJB:JWB:03-29-05

a. Description. The pavement performance warranty shall consist of satisfying the warranty requirements of the work contained in the appendices. This special provision establishes the common terms and definitions applied to the pavement requiring warranted work. The pavement performance warranty assures and protects the Department from specific defects found in the pavement.

b. Definitions.

1. Acceptance Date of Warranted Work - The date when the warranted work is complete and has been determined by the Department to be in compliance with the contract specifications and is continuously open to traffic. This is the date of initial acceptance and constitutes the start date for the warranty period. There may be more than one acceptance date of warranted work for a project.
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Department determines that all contract requirements have been met for the warranted work. The date on which initial acceptance occurs is termed the Acceptance Date of Warranted Work.

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1. Reserves the right to approve the time, traffic control and methods for performing any warranty work by permit through the Region utilities and permit process.
2. Reserves the right to approve the schedule proposed by the Contractor to perform warranty work.
3. Reserves the right to approve all materials and specifications used in warranty work.
4. Reserves the right to determine if warranty work performed by the Contractor meets the contract specifications.
5. Reserves the right to perform, or have performed, routine maintenance during the warranty period, which routine maintenance will not diminish the Contractor's responsibility under the warranty.
6. Reserves the right, if the Contractor is unable, to make immediate emergency repairs to the pavement to prevent an unsafe road condition caused by defective warranted work as determined by the Department. The Department will attempt to notify the contractor that action is required to address an unsafe condition. The Department will record the time and date of attempts for Contractor notification. However, should the contractor be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any emergency repairs deemed necessary. Any such emergency repairs undertaken will not relieve the contractor from meeting the warranty requirements of this Special Provision. Any costs associated with the emergency repairs will be paid by the Contractor.

7. Is responsible for monitoring the pavement throughout the warranty period and will provide the Contractor any written reports of the surface condition and/or maintenance activities related to pavement performance when requested.
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3. Is responsible for performing all temporary or emergency repairs, resulting from being in non-compliance with the warranty requirements, using Department approved materials and methods.
4. Shall notify the Department and submit a written course of action for performing the needed warranty work a minimum of ten calendar days prior to commencement of warranty work, except in the case of emergency repairs as detailed in this special provision. The submittal must propose a schedule for performing the warranty work and the materials and methods to be used.
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8. Shall complete all warranty work prior to conclusion of the warranty period, or as otherwise agreed to by the Department.

9. Shall be liable during the warranty period in the same manner as contractors currently are liable for their construction related activities with the Department pursuant to the Interim 2003 Standard Specifications for Construction, including, but not limited to subsections 103.06, 107.10 and 107.11. This liability shall arise and continue only during the period when the Contractor is performing warranty work. This liability is in addition to the Contractor performing and/or paying for any required warranty work, and shall include liability for injuries and/ or damages and any expenses resulting therefrom which are not attributable to normal wear and tear of traffic and weather, but are due to non-compliant materials, faulty workmanship, and to the operations of the Contractor as set forth more fully in subsections 103.06, 107.10 and 107.11 of the Interim 2003 Standard Specifications for Construction.

g. Evaluation Method. The Department will conduct pavement evaluations by dividing the project into segments. Each individual driving lane will be divided into segments of 528 feet (1/10 mile) in length for measuring and quantifying the condition parameters. Evaluation will include use of both the Department's Pavement Management System and/or field pavement condition reviews. This evaluation may be waived in emergency situations.

The beginning point for laying out segments will be the Point of Beginning (POB) of the project. Segments will be laid out consecutively to the Point of Ending (POE) of the project. The original segmentation of the project will be used for all successive reviews throughout the warranty period.

h. Warranty Requirements. Warranty work will be required when the following two criteria are met as a result of a failure to meet the performance parameters.

Criterion 1 -The threshold limit for a performance parameter is exceeded, and

Criterion 2 - The maximum allowable number of defective segments is exceeded for one or more performance parameters for a warranty lane, unless otherwise noted in the appendices.

Specific threshold limits and segment limits are covered in the appendix.

During the warranty period, the Contractor will not be held responsible for pre-existing conditions and factors beyond his control. These include, but are not limited to: chemical and fuel spills, vehicle fires, snow plowing, and any testing by the Department, such as coring. Other factors considered to be beyond the control of the Contractor which may contribute to pavement distress will be considered by the Engineer on a case by case basis upon receipt of a written request from the Contractor.

i. Conflict Resolution Team. The sole responsibility of the Conflict Resolution Team (CRT) is to provide a decision on disputes between the Department and the Contractor regarding application or fulfillment of the warranty requirements. The CRT will consist of five members:

- Two members selected, and compensated by the Department.
- Two members selected and compensated by the Contractor.
- One member mutually selected by the Department and the Contractor. Compensation for the third party member will be equally shared by the Department and the Contractor.

If a dispute arises on the application or fulfillment of the terms of this warranty, either party may serve written notice that appointment of a CRT is required.

At least three members of the CRT must vote in favor of a motion to make a decision. The CRT may decide to conduct a forensic investigation, will determine the scope of work and select the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Contractor and the Department based on the determined cause of the condition.

j. Emergency Repairs. If the Department determines that emergency repairs are necessary for public safety, the Department or its agent may take repair action. Emergency repairs must be authorized by the Region Engineer.

Prior to emergency repairs, the Department will document the basis for the emergency action. In addition, the Department will preserve evidence of the defective condition.

k. Non-extension of Contract. This Special Provision shall not be construed as extending or otherwise affecting the claim process and statute of limitation applicable to this Contract.

l. Measurement and Payment. All costs, including engineering and maintaining traffic costs, associated with meeting the requirements of this special provision are considered to be included in the Contract unit prices for the warranted work items regardless of when such costs are incurred throughout the warranty period. These costs include but are not limited to, all materials, labor and equipment necessary to complete required warranty work.

**PAVEMENT PERFORMANCE WARRANTY APPENDIX FOR
COLD MILLING & ONE COURSE HOT MIX ASPHALT OVERLAY**

- A1. Application.** This appendix applies to pavement warranties for coldmill and 1 ½" preventive maintenance HMA overlays.
- A2. Limits of Warranted Work.** The warranted work includes all hot mix asphalt on warranty lanes within the project limits unless otherwise indicated on the plans.
- A3. Warranty Term.** The warranty term will be three years from the date of Initial Acceptance otherwise termed the Acceptance Date of Warranted Work.
- A4. Warranty Bond.** The bond will equal 100% of the contract cost for the warranted work.
- A5. Initial Ride Quality Acceptance Criteria.** The Department will measure the ride quality prior to placement of the HMA overlay. Subsequent to placement of the overlay, the Department will also measure the pavement ride quality. Both measurements will be expressed in terms of the Michigan Ride Quality Index (RQI). Ride quality measurements will be conducted and evaluated separately for each warranty lane. Shoulder work is exempt from ride quality measures.

The pavement ride quality, for each warranty lane, must meet the following criteria subsequent to the HMA overlay,

- 1) Each individual tenth mile segment of each lane must have an RQI value equal to or lower than the initial value prior to the overlay.
 - 2) The overall average for each lane must be improved by 25 percent from the initial value or down to an RQI of 45.
- A6. Condition Parameters.** Condition parameters are used to measure the performance of the HMA pavement during the warranty term. Each condition parameter has a threshold level applied to each segment and a maximum number of defective segments allowed before corrective action (warranty work) is required.

Definitions

Longitudinal Crack/Open Joint - A crack or open joint, at least five feet in length that is oriented primarily in the longitudinal direction versus the transverse direction. That is, the angle between the overall crack line and the centerline is less than 45 degrees. It can exist anywhere in the warranty lane; i.e., at the pavement centerline joint, wheel path, center of lane, or lane/shoulder joint. This does not include reflective cracking from underlying pavement.

De-bonding - A physical separation of two HMA layers. De-bonding will be visually identified as shoving, or the loss of the new surface course. Surface potholes, regardless of depth, will be classified as de-bonding.

Raveling - Surface disintegration, due to the loss of coarse or fine aggregate material, that occurs over an area or in a continuous longitudinal strip.

Flushing - The accumulation of excess asphalt binder on the pavement surface that creates a shiny, reflective condition and becomes tacky to the touch at high temperatures.

Rutting - A longitudinal surface depression in the wheel path. It may have associated transverse displacement or humping.

- A7. Warranty Requirements.** Table 2 lists the allowable threshold limit for each condition parameter within each segment and the maximum number of allowable segments within a warranty lane for each condition parameter. If the threshold is exceeded for a condition parameter, for more than the maximum number of allowable segments, corrective action (warranty work) is required.

The defective segments for surface distress may or may not be contiguous to necessitate corrective action. The maximum allowable number of defective segments for each condition parameter applies to each warranty lane in each travel direction. Each warranty lane shall be evaluated independent of adjacent warranty lanes. Any pavement surface requiring removal/replacement to correct deficiencies, for any condition parameter, shall be replaced full-width across the warranty lane.

TABLE 1 - WARRANTY REQUIREMENTS FOR COLDMILLING & ONE COURSE HMA OVERLAY

CONDITION PARAMETER	THRESHOLD LIMITS PER SEGMENT (Length = 528 feet)	MAX. DEFECTIVE SEGMENTS (1)
Longitudinal Cracking/ Open Joint	25% of segment length	1
De-bonding ⁽⁴⁾	25% of segment length	1
Raveling	20% of segment length	1
Flushing	5% of segment length	1
Rutting ^{(3) (4)}	ave. rut depth = 1/4 inch ⁽²⁾	1
<p>1 The maximum allowable number of defective segments per warranty lane is determined by multiplying by the length of the specific warranty lane in miles.</p> <p>2 The rut depth threshold applies to each wheel path independently.</p> <p>3 The pavement surface will be evaluated for the presence of rutting on each warranty lane throughout the warranty period. The pavement surface will be measured beginning at the POB and every 132 feet thereafter to determine average rut depth to quantify rutting for a particular segment. Rut measurements will be done using a straight rigid device that is a minimum of 7 feet long and of sufficient stiffness that it will not deflect from its own weight, or a wire under sufficient tension to prevent sag when extended 7 feet. Measurements will be taken by placing this "straightedge" across the pavement surface perpendicular to the direction of travel. The straightedge shall contact the surface on at least two bearing points with one located on either side of the rut. The straightedge is properly located when sliding the straightedge along its axis does not change the location of the contact points. Rut depth is then measured at the point of greatest perpendicular distance from the bottom of the straightedge to</p> <p>4) Does not apply to shoulder.</p>		

- A8. Corrective Actions.** The Contractor will propose corrective action subject to Department approval. The Department will accept the proposed corrective action if the action will correctly restore both the original preventive maintenance treatment and the benefit that the treatment provides to the underlying pavement structure.

**MICHIGAN DEPARTMENT OF TRANSPORTATION
INITIAL ACCEPTANCE
FOR
PAVEMENT WARRANTY**

CONTRACT ID: _____	
CONTROL SECTION: _____	JOB NUMBER: _____
SURETY NAME _____	
SURETY ADDRESS: _____	
CONTRACTOR NAME: _____	
CONTRACTOR ADDRESS _____	

<i>IDENTIFY EACH JOB NUMBER, LOCATION AND WORK SEPARATELY</i>					
JOB NUMBER	ROUTE NUMBER	CONTROL SECTION	WORK TYPE	DATE ACCEPTED	PROJECT ENGINEER

INITIAL ACCEPTANCE OF WARRANTY WORK APPROVAL	
CONTRACTOR'S SIGNATURE: _____	
ENGINEER'S SIGNATURE: _____	
ACCEPTANCE DATE: _____	

**MICHIGAN
DEPARTMENT OF TRANSPORTATION
PAVEMENT WARRANTY BOND**

Bond Number _____

KNOWN ALL MEN BY THESE PRESENTS:

That we, _____ (hereinafter called the "Principal"), and _____, a corporation duly organized under the laws of the State of _____ and duly licensed to transact business in the State of Michigan (hereinafter called "Surety"), are held and firmly bound unto the Michigan Department of Transportation (hereinafter called the "Obligee"), in the sum of _____ Dollars (\$), for the payment of which sum well and truly to be made, we, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has heretofore entered into a contract with the Michigan Department of Transportation dated _____ under Contract ID _____ and;

WHEREAS, the said Principal is required to guarantee the _____ installed under said contract, against specific pavement defects which may develop during the period(s) of _____ years beginning the date(s) of the Acceptance Date of Construction by the Obligee.

In no event shall losses paid under this bond aggregate more than the amount of the bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal shall faithfully carry out and perform the said guarantee, and shall, on due notice, repair and make good at its own expense any and all specific pavement defects in the said work which may develop during the period specified above or shall pay over, make good and reimburse to the said Obligee all loss and damage which said Obligee may sustain by reason of failure or default of said Principal so to do, then this obligation shall be null and void; otherwise shall remain in full force and effect.

PROVIDED HOWEVER, that in the event of any default on the part of said Principal, a written statement of the particular facts showing such default and the date thereof shall be delivered to the Surety by registered mail, within thirty (30) days after the Obligee or his representative shall learn of such default and that no claim, suit or action by reason of any default of the Principal shall be brought hereunder after the expiration of thirty (30) days from the end of the warranty period as herein set forth.

Signed this _____ day of _____, _____.

Contractor

By

Surety

By

Attorney-In-Fact

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**FURNISHING AND PLACING ONE COURSE MARSHALL
HOT MIX ASPHALT OVERLAY
(Capital Preventive Maintenance)**

C&T:JWB

1 of 10

C&T:APPR:CJB:KPK:03-28-05

a. Description. This special provision sets forth the quality control and quality assurance procedures that will be followed for acceptance of and payment for hot mix asphalt (HMA). Except as modified by this or other contract documents, the standard specifications shall apply. In cases where this special provision may conflict with another special provision or supplemental specification, this special provision will prevail.

1. Terminology.

Quality Control (QC) - All activities that have to do with making the quality of a product what it should be: including training, materials sampling and testing, project oversight and documentation.

Quality Assurance (QA) - All activities that have to do with making sure the quality of a product is what it should be: including materials sampling and testing, construction inspection, and review of Contractor quality control documentation.

HMA Design - The selection and proportioning of aggregate(s), mineral filler (if required), reclaimed asphalt pavement (RAP), and asphalt binder such that the specified mixture design criteria are met. Laboratory evaluation is required to determine if the stated mix design complies with specifications.

Job Mix Formula (JMF) - A HMA mixture for a specific project. This may include adjustments to the mix design to optimize the field application.

Target Value - A JMF parameter value which may be adjusted, if approved by the Engineer, to account for changes in the physical properties of the mixture.

JMF Adjustment - The Contractor may propose an adjustment to the JMF based on QC and/or QA test results. The proposed JMF must meet the requirements of the special provision for Superpave HMA Mixtures included in this proposal. When approved by the Engineer, a JMF adjustment may be applied retroactively to one lot, for parameters with target values.

Voids in Mineral Aggregate (VMA) - The volume of void space between the aggregate particles of a compacted paving mixture that includes the air voids and the asphalt binder including the absorbed asphalt binder, expressed as a percent of the total volume of mixture.

Effective Specific Gravity (G_{se}) - The ratio of the oven dry weight in air of a unit volume of an aggregate (excluding voids permeable to asphalt) at a stated temperature to the weight of an equal volume of water at a stated temperature.

Bulk Specific Gravity of Aggregate (G_{sb}) - The ratio of the oven dry weight in air of a unit volume of an aggregate at a stated temperature to the weight of an equal volume of water at a stated temperature.

Maximum Specific Gravity of Mixture (G_{mm}) - The ratio of the weight in air of a unit volume of an uncompacted HMA at a stated temperature to the weight of an equal volume of water at a stated temperature.

Lot - HMA mixture produced and placed under this special provision is evaluated on a lot-by-lot basis. A lot is made up of a discrete tonnage of one mixture. Each lot is made up of three sublots. These sublots will be of approximately equal size of 1500 tons.

If only one or two sublots are included in a lot at the end of production, they will be combined with the previous lot using the same mix and this combined lot will be evaluated based on all subplot samples.

Initial Production Lot - All testing for the initial production lot must be completed prior to any further mixture production, unless prior approval is received from the Engineer. The Contractor will be allowed to continue production if all the QA test results for this lot are within the single test and lot average tolerances specified in Table 2 and no JMF changes are requested.

Lot Average Test Result - The average of all subplot QA test results, for a specific parameter, for the lot. Test results for any subplot removed from the project will not be used in calculating a lot average. However, the replacement material will be tested and the results included in the lot average.

Trial Run - With prior approval of the Engineer, the Contractor may produce and test the mixture(s) to be used on this project prior to placing the mixture(s). The testing frequency will be as specified in this special provision. Requests for JMF adjustments may be made based on the trial run test results. All costs associated with the trial run, including materials and testing will be borne by the Contractor.

Process Quality Control Targets - These targets are established by the Contractor, based on initial production lot test results (and from any approved trial run), for air voids, VMA, asphalt binder content and G_{mm} . QC tolerances will be applied to these established targets to determine the need for production changes, including stopping production, to control the quality of the product. Process quality control targets must be reported to the Engineer prior to the end of placement of the second lot.

Rounding of Numbers - Rounding of numerical data will follow ASTM E29, Rounding Method as described in the HMA Production Manual.

Random Sampling - Except as modified herein, QA sample locations will be determined as outlined in section A-12 of the *Materials Quality Assurance Manual*.

- A. Prior to the pre-production meeting, the Engineer will generate three columns of random numbers using a computer spreadsheet program or a calculator. The random numbers will be used for the longitudinal and the transverse measurement for determining the core location and the HMA mixture sample location. An excess amount of random numbers will be generated to take into account overruns or any situation where another random number is required.
 - B. At the pre-production meeting each page that lists random numbers, with the numbers covered by a separate sheet of paper, will be presented to be signed by the HMA-QC Plan Administrator and the Engineer.
 - C. The original signed list will be placed in the project file and a copy will be provided to the field inspector for the project.
 - D. When the project is completed a copy of the list of random numbers will be provided to the Contractor upon request.
2. **Sampling and Testing Procedures.** In addition to the requirements of the standard specifications and the HMA Production Manual, the following sampling and testing procedures are to be followed in completing this work.

ASTM

- D 1559-89 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (Section 4.5)
- D 2172 Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
- D 2041 Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- D 2726 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C 117 Test Method for Materials finer than 75- μ m (no. 200) Sieve in Mineral Aggregates by Washing
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

MTM (Michigan Test Method)

- 311 Determining Aggregate Gradation for Bituminous Mixture
- 117 Determining Percentage of Crushed Particles in Aggregates
- 118 Measuring Fine Aggregate Angularity
- 110 Determining Deleterious and Objectionable Particles in Aggregates
- 319 Determination of Asphalt Content from Asphalt Paving Mixtures by the Ignition Method
- 313 Sampling Bituminous Mixtures
- 324 Sampling HMA Mixtures from Behind the Paver

b. Equipment. All equipment requirements of Section 502 of the Standard Specifications for Construction shall apply.

c. Quality Control. The Engineer will not sample or test for quality control or assist in controlling the Contractor's production or placement operations. The Contractor will be responsible for establishing a Quality Control Plan that contains all of the elements listed in Section 503 of the Standard Specification for Construction.

In order to be used in making the decision for the Retest and Appeal Process (section e.), QC sample shall be obtained using a random sampling procedure. Each test report associated with the sample must include an identifier to allow all test reports to be linked to a specific lot or subplot within the project. Non-random QC HMA (loose) samples can also be taken.

The Contractor shall maintain daily control charts and have them available for review at the plant at all times. Copies of these control charts shall be provided to the Engineer if requested. All test results shall be plotted and used in quality control decisions. When corrective action is necessary, the Contractor shall notify the Engineer in writing of the specific action taken. Failure to take corrective action as required will result in negative adjustment to the unit price for HMA as described in section (g) of this special provision.

1. **HMA (Loose) Gradation.** The Contractor shall test the mixture gradation for all sieve sizes reported on the JMF.
2. **HMA (Loose) Volumetrics.** If the difference between the established process quality control targets and the QC test results exceed the single test or running average of five tolerances shown in Table 1, the Contractor will immediately notify the Engineer, follow the QCP and necessary corrective action(s), if any, shall be implemented.

If the next QC test for that mixture again exceeds a QC tolerance, production shall stop and the Contractor shall immediately notify the Engineer. The Engineer will evaluate the Contractor's proposal for bringing production back into specification and either request further investigation or concur with the Contractor's proposal and allow production to restart.

d. Quality Assurance.

1. **Pavement Density.** The Engineer will identify 6 core sample locations for each lot based on longitudinal and transverse measurements. The Engineer will mark each core location with a two-inch diameter paint dot, which represents the center of the core. The Contractor shall drill a 6 inch core sample at each core location. The Contractor shall notify the Engineer sufficiently in advance of coring to ensure that MDOT has a representative to witness the coring operation and take immediate possession of the cores. The core samples shall be taken after final rolling and at the completion of a lot.

As an option, when mutually agreed to by the Engineer and Contractor, the core samples shall be taken prior to traffic staging changes, or at another time that is independent of paving operations. The Contractor shall provide traffic control as required in the special provision for maintaining traffic.

Cores shall not be taken within the segments in which mixture sampling from behind the paver is conducted, hand patching areas or driveways. If the center of the core is less than 5 inches from either edge of pavement, select another transverse random number and move the core to the new location. Core samples shall not be damaged during

removal from the roadway. If, for any reason, a core is damaged or determined not to be representative at the time of coring, the Engineer will evaluate and document the problem and determine if re-coring is necessary.

The minimum core thickness for each mixture type is:

HMA Mixture No.	Minimum Core Thickness
2	2 1/4 inch
3	1 1/2 inch
4	1 1/8 inch
13	1 1/4 inch
36	1 1/8 inch

Cores shall be measured at the time they are extracted from the pavement. Any core disqualified based on the minimum thickness criteria will be discarded and a new core location selected by the Engineer. If more than 50 percent of the cores in a lot are disqualified, production shall stop. Production will not be allowed to continue until the Engineer has confirmed that the paving operation is meeting the contract application rate. The Engineer shall take immediate possession of cores after they are removed from the pavement by the Contractor. The Engineer will maintain continual custody of the cores until they are tested.

All previous pavement, base aggregate or bond coat material shall be sawed off the bottom of the core samples by the Engineer.

The Contractor will be allowed to take up to 6 informational cores per lot for quality control. These cores must be no closer than 2 feet center to center from the MDOT quality assurance (QA) core locations. The size of the Contractor's core must be 5 inches or less in diameter. Any additional informational cores will require the approval of the Engineer.

The core holes shall be filled with hot mixture, and thoroughly compacted as part of the coring operation. The method of filling holes and obtaining compaction shall be agreed upon prior to production.

Pavement density acceptance testing will be completed by the Engineer within four (4) work days after the Engineer has taken possession of the cores at the project site. Testing will be in accordance with ASTM D 2726. The Engineer's test results on the compacted HMA will be used as a basis of acceptance and payment.

- 2. Plant Produced Material (Mixture) QA Sampling and Testing.** Location of QA sample sites within each subplot will be by a random process managed by the Engineer. Immediately after the Engineer acquires the samples, fill the voids with HMA.

The Engineer will sample the mixture in accordance with MTM 324, collecting two separate-independent 20,000-gram samples at each sample site. These are the QA and appeal samples. The Engineer will assign an identifier to each sample consisting of contract ID, mixture, lot and subplot and deliver the samples to the MDOT Region HMA Laboratory where one 20,000-gram sample may be selected for testing and the other 20,000-gram sample will be retained for possible appeal testing.

One subplot sample will be randomly chosen for Department acceptance testing. If the test results are within the single test tolerance shown in Table 2, then the HMA will be accepted for the entire lot. If the test results exceed the tolerances of Table 2, then the remaining subplot samples will be tested. If the average of the test results meets the lot average tolerance of Table 2, then the HMA will be accepted for the lot. If these criteria are not satisfied, the HMA price adjustments detailed in section g. and Table 3 of this Special Provision will be applied.

Plant produced material acceptance testing will be completed by the Engineer within four calendar days after the completion of the lot. The Engineer will conduct the following tests.

- A. Maximum Specific Gravity, G_{mm} (MTM 314)
 - B. Bulk Compacted Density, N_{max} (ASTM D 1559 paragraph 4.5)
 - C. Air Voids, (calculated)
 - D. Voids in Mineral Aggregate, VMA (calculated)
 - E. Composition of the Mixture- Asphalt binder content based on calculated value using subplot maximum specific gravity (G_{mm}) and current JMF effective specific gravity (G_{se}); the retained G_{mm} shall be used for gradation (ASTM C 136, C 117) and crushed particle content (MTM 117) from extracted (ASTM D 2172) or incinerated (MTM 319) aggregate, or from MTM 311.
3. **Daily Asphalt Binder Certification Verification Samples.** Obtain the asphalt binder sample, correctly label the sample container, and complete a Sample Identification (Bituminous Material) (Form 1923B) dated (02/03). The form must be filled out correctly and completely, and signed before the sample is given to the Engineer. The daily asphalt binder sample must be taken from a sampling spigot located on the pipeline supplying asphalt binder to the plant, in a position between the asphalt binder pump and the point where the asphalt binder enters the mixture. Personnel safety is critical in selecting the position of the sampling spigot. Give the binder sample and completed Form 1923B to the Engineer.

Collect the daily asphalt binder sample in a one-pint (16 ounce), slip top, seamless ointment tin. The tin must be at least three quarters full. Three one-point containers must be obtained if the binder being sampled has the "P" designation (e.g., PG 70-28P). One of these three containers must be marked with the letter "R", designating it as a referee sample. This is described in the Special Provision for Polymer Modified Performance Grade Binders included in the contract documents. All containers must be labeled in a legible format with the following information.

- MDOT control section and job number
- Binder grade
- Binder supplier certifier number
- Supplier name, city and state
- Date sampled
- Mix type

The Engineer may request to witness the sampling of the asphalt binder upon any visit to the HMA plant. The Engineer will complete the 1923B (02/03) form for the witness sample. The witness sample will become the daily asphalt binder sample of record. Any other binder sample taken that same day will be discarded.

The Engineer may request a copy of the MDOT Binder Certification Documents. These copies must be presented to the Engineer when the respective daily binder samples and 1923B (02/03) forms are picked up at the plant. The Engineer will review these documents and communicate any problems that may arise. The Engineer will deliver the certification documents to the MDOT C&T Central Laboratory.

e. Retest and Appeal Process for Plant Produced Material (Mixture). At the Engineer's request, the MDOT C&T Central Laboratory may perform appeal testing on all or part of the remaining subplot appeal samples. A request may be made by the Contractor to the Engineer to review the quality control test results and consider the quality control test results in determining if appeal testing is warranted. Quality control test results must be within the lot averages of Table 2 to be considered. All appeal samples will be properly identified and sent to the MDOT C&T Central Central Laboratory for testing. Using the same test method option, the appeal sample will be tested for all QA parameters. All test data will be delivered to the Engineer. All appeal results will replace original QA test results.

f. Project Documentation. The format of all test reports and quality control charts to be submitted by the Contractor will be approved by the Engineer before mixture production is allowed to commence. Suggested formats of reports and charts are available from the Engineer. Project documentation to be provided by the Contractor shall include, but may not be limited to, the following.

1. **Lot Basis.** Control charts of all test data must be current (data should be plotted as soon as the test is complete) and available for review by the Engineer.
2. **Project Summation.** Control charts for all test data indicating individual test values, lot averages and the running average of five.

g. Measurement and Payment. Separate payment will not be made for providing and maintaining an effective hot mix asphalt quality control program as specified by this special provision. All costs associated with the work described in this special provision will be included in the applicable unit prices for the related HMA mixtures. HMA, (type) will be measured as specified in section 502.04 of the standard specification and the contract documents.

1. **HMA Mixture Unit Price Adjustment.** Adjustments to the contract unit price for **HMA** will be calculated for each of four sets of criteria. The largest adjustment allowable in each case will be imposed and unit price adjustments will be applied cumulatively (pavement density +HMA + failure to suspend operations) to the affected tonnage. Each of the unit price adjustments is detailed below.
 - A. **Pavement Density** - Based on pavement cores tested by the Engineer, either a 10 percent or a 25 percent adjustment in the **HMA Mixture** contract unit price may be imposed. The following criteria will be used and only the highest calculated pavement density price adjustment will be applied.

- i. A negative 10 percent adjustment in the **HMA Mixture** contract unit price will be imposed if either the lot average pavement density is less than 92.0 percent but equal to or greater than 91.0 percent or the conditions of column (1) of the Pavement Density Core Table (Table 4) are satisfied.
 - ii. A negative 25 percent adjustment in the **HMA Mixture** contract unit price will be imposed if either the lot average pavement density is less than 91.0 percent but equal to or greater than 90.0 percent or the conditions of column (2) of the Pavement Density Core Table (Table 4) are satisfied.
 - B. Hot Mix Asphalt Mixture - If, for asphalt binder content, air voids, G_{mm} or VMA the difference between the lot average and the JMF is within the lot average tolerance shown in Table 2, no adjustment will be made to the unit price for **HMA Mixture** under this criteria.

If the lot average tolerance is exceeded for one or more parameter, a negative adjustment will be made to the contract unit price for **HMA Mixture** in accordance with Table 3. Only the largest of the four possible pay adjustments for this set of criteria will be assessed. This price adjustment is applied to the entire lot tonnage.
 - C. Failure to Suspend Operations - If at any time during production, testing shows that a deviation has occurred which requires production to be suspended and the Contractor continues to operate, the subplot in production at the time shutdown should have occurred, and any subsequent tonnage, will be subject to a negative 25 percent unit price adjustment until testing shows that specification material is again being produced.
2. **Removal.** The cost of the mixture removed and the removal cost will be borne by the Contractor. Removal decisions will be applied to the entire lot.
- A. If, for other than the initial production lot of base course, pavement density for any lot (average of the 6 lot cores) is less than 90.0 percent, the Contractor shall remove and replace the lot.
 - B. If the total contract unit price adjustment applied to a lot is 60 percent or more, the lot will be evaluated by the Engineer. If the Engineer determines that removal is warranted, the Contractor shall remove and replace the lot.
 - C. The Engineer reserves the right to evaluate any lot whose test results for asphalt binder content, G_{mm} , VMA, or air voids, exceed the single test tolerances shown in Table 2. If the Engineer determines that the in-place mixture will not perform in accordance with normal standards the Contractor shall remove and replace the lot.

**Table 1: HMA Quality Control Testing Tolerances (+ or -)
From Process Quality Control Targets**

Parameter	Single Test	Running Average of Five
Air Voids	1.00%	0.50%
Voids in Mineral Aggregate (VMA) *	1.20%	0.60%
Maximum Specific Gravity (Gmm) *	0.019	0.010
Asphalt Binder Content *	0.50%	0.30%
Crushed Particle Content *	15.0%	10.0%
Aggregate Gradation *		
Sieve Size	Percent Passing	
No. 8	5.00%	2.50%
No. 200	1.40%	0.70%
*Parameters with Target Values		

Table 2: HMA Quality Assurance Testing Tolerances (+ or -) from JMF

Parameter	Single Test	Lot Average
Air Voids	1.00%	0.60%
Voids in Mineral Aggregate (VMA) *	1.20%	0.75%**
Maximum Specific Gravity (Gmm) *	0.019	0.012
Asphalt Binder Content *	0.50%	0.35%
*Parameters with Target Values		
**Or Less determined by VMA Value from the special provision for Marshall HMA Mixtures.		

Table 3: HMA Mixture Pay Adjustments

Parameter (lot average)	Deviation (d)	Negative Unit Price Adjustment (%)
Asphalt Binder Content (deviation from JMF)	$0.35 < d \leq 0.55$ $d > 0.55$	10 25
Air Voids (deviation from JMF)	$0.6 < d \leq 0.7$ $0.7 < d \leq 0.8$ $0.8 < d \leq 1.0$ $1.0 < d \leq 1.1$ $1.1 < d \leq 1.2$ $d > 1.2$	2 4 6 8 10 25
Maximum Specific Gravity (Gmm) (deviation from JMF)	$0.012 < d \leq 0.014$ $0.014 < d \leq 0.015$ $0.015 < d \leq 0.017$ $0.017 < d \leq 0.019$ $0.019 < d \leq 0.021$ $d > 0.021$	2 4 6 8 10 25
Voids in Mineral Aggregate (VMA) (deviation below minimum value in the 1996 Standard Specifications for Construction)	$0.0 < d \leq 0.1$ $0.1 < d \leq 0.3$ $0.3 < d \leq 0.4$ $0.4 < d \leq 0.5$ $0.5 < d \leq 0.6$ $d > 0.6$	2 4 6 8 10 25

Table 4: Pavement Density Core Table

Total Number of Cores Tested	Minimum Number of Cores Less Than 92.0% * COLUMN 1 (-10%)	Minimum Number of Cores Less Than 91.0% * COLUMN 2 (-25%)
3	2	2
4	2	2
5	2	2
6	3	2
7	3	2
8	3	2
9	3	2
10	3	3
11	4	3
12	4	3
13	4	3
14	4	3
15	4	4
16	5	4
17	5	4
18	5	4
19	5	4
20	5	5
*Note: A mixture requiring an air void target value lower than 3.0 percent for non-traffic areas will require a corresponding increase in the pavement density values.		

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
**FURNISHING AND PLACING ONE COURSE SUPERPAVE
HOT MIX ASPHALT OVERLAY
(Capital Preventive Maintenance)**

C&T:JWB

1 of 11

C&T:APPR:CJB:KPK:03-28-05

a. Description. This special provision sets forth the quality control and quality assurance procedures that will be followed for acceptance of and payment for hot mix asphalt (HMA). Except as modified by this or other contract documents, the standard specifications shall apply. In cases where this special provision may conflict with another special provision or supplemental specification, this special provision will prevail.

1. Terminology.

Quality Control (QC) - All activities that have to do with making the quality of a product what it should be: including training, materials sampling and testing, project oversight and documentation.

Quality Assurance (QA) - All activities that have to do with making sure the quality of a product is what it should be: including materials sampling and testing, construction inspection, and review of Contractor quality control documentation.

HMA Design - The selection and proportioning of aggregate(s), mineral filler (if required), reclaimed asphalt pavement (RAP), and asphalt binder such that the specified mixture design criteria are met. Laboratory evaluation is required to determine if the stated mix design complies with specifications.

Job Mix Formula (JMF) - A HMA mixture for a specific project. This may include adjustments to the mix design to optimize the field application.

Target Value - A JMF parameter value, which may be adjusted, if approved by the Engineer, to account for changes in the physical properties of the mixture.

JMF Adjustment - The Contractor may propose an adjustment to the JMF based on QC and/or QA test results. The proposed JMF must meet the requirements of the special provision for Superpave HMA Mixtures included in this proposal. When approved by the Engineer, a JMF adjustment may be applied retroactively to one lot, for parameters with target values.

Voids in Mineral Aggregate (VMA) - The volume of void space between the aggregate particles of a compacted paving mixture that includes the air voids and the asphalt binder not absorbed into the aggregate, expressed as a percent of the total volume of mixture.

Effective Specific Gravity (G_{se}) - The ratio of the oven dry weight in air of a unit volume of an aggregate (excluding voids permeable to asphalt) at a stated temperature to the weight of an equal volume of water at a stated temperature.

Bulk Specific Gravity of Aggregate (G_{sb}) - The ratio of the oven dry weight in air of a unit volume of an aggregate at a stated temperature to the weight of an equal volume of water at a stated temperature.

Maximum Specific Gravity of Mixture (G_{mm}) - The ratio of the weight in air of a unit volume of an uncompacted HMA at a stated temperature to the weight of an equal volume of water at a stated temperature.

Lot - HMA mixture produced and placed under this special provision is evaluated on a lot-by-lot basis. A lot is made up of a discrete tonnage of one mixture. Each lot is made up of three sublots. These sublots will be of approximately equal size of 1500 tons.

If only one or two sublots are included in a lot at the end of production, they will be combined with the previous lot using the same mix and this combined lot will be evaluated based on all subplot samples.

Initial Production Lot - All testing for the initial production lot must be completed prior to any further mixture production, unless prior approval is received from the Engineer. The Contractor will be allowed to continue production if all the QA test results for this lot are within the single test and lot average tolerances specified in Table 2 and no JMF changes are requested.

Lot Average Test Result - The average of all subplot QA test results, for a specific parameter, for the lot. Test results for any subplot removed from the project will not be used in calculating a lot average. However, the replacement material will be tested and the results included in the lot average.

Trial Run - With prior approval of the Engineer, the Contractor may produce and test the mixture(s) to be used on this project prior to placing the mixture(s). The testing frequency will be as specified in this special provision. Requests for JMF adjustments may be made based on the trial run test results. All costs associated with the trial run, including materials and testing will be borne by the Contractor.

Process Quality Control Targets - These targets are established by the Contractor, based on initial production lot test results (and from any approved trial run), for air voids, VMA, asphalt binder content and G_{mm} . QC tolerances will be applied to these established targets to determine the need for production changes, including stopping production, to control the quality of the product. Process quality control targets must be reported to the Engineer prior to the end of placement of the second lot.

Rounding of Numbers - Rounding of numerical data will follow ASTM E29, Rounding Method as described in the HMA Production Manual.

Random Sampling - Except as modified herein, QA sample locations will be determined as outlined in section A-12 of the *Materials Quality Assurance Manual*.

- A. Prior to the pre-production meeting, the Engineer will generate three columns of random numbers using a computer spreadsheet program or a calculator. The random numbers will be used for the longitudinal and the transverse measurement for determining the core location and the HMA mixture sample location. An excess amount of random numbers will be generated to take into account overruns or any situation where another random number is required.
 - B. At the pre-production meeting, each page that lists random numbers, with the numbers covered by a separate sheet of paper, will be presented to be signed by the HMA-QC Plan Administrator and the Engineer.
 - C. The original signed list will be placed in the project file and a copy will be provided to the field inspector for the project.
 - D. When the project is completed, a copy of the list of random numbers will be provided to the Contractor upon request.
2. **Sampling and Testing Procedures.** In addition to the requirements of the Standard Specifications for Construction and the *HMA Production Manual*, the following sampling and testing procedures are to be followed in completing this work.

ASTM

- D 2172 Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
- D 2041 Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- D 2726 Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C 117 Test Method for Materials finer than 75- μ m (no. 200) Sieve in Mineral Aggregates by Washing
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

AASHTO

- R 30 Mixture Conditioning of Hot Mix Asphalt (HMA)
- R 35 Superpave Volumetric Design for Hot Mix Asphalt (HMA)
- T 312 Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave™ Gyratory Compactor
- PP 35 Evaluation of Superpave™ Gyratory Compactors (SGCs)

MTM (Michigan Test Method)

- 311 Determining Aggregate Gradation for Bituminous Mixture
- 117 Determining Percentage of Crushed Particles in Aggregates
- 118 Measuring Fine Aggregate Angularity
- 110 Determining Deleterious and Objectionable Particles in Aggregates
- 319 Determination of Asphalt Content from Asphalt Paving Mixtures by the Ignition Method
- 313 Sampling Bituminous Mixtures
- 324 Sampling HMA Mixtures from Behind the Paver

b. Equipment. A Superpave gyratory compactor (SGC) shall be provided by the Contractor at the plant site for QC testing. The compactor must be successfully evaluated in accordance with AASHTO PP 35-98. The report of this evaluation shall be available for review by the Engineer.

The Contractor shall provide, and install with the SGC, a computer, monitor, mouse, printer, and software capable of data acquisition and reporting.

c. Quality Control. The Engineer will not sample or test for quality control or assist in controlling the Contractor's production or placement operations. The Contractor will be responsible for establishing a Quality Control Plan that contains all of the elements listed in Section 503 of the Standard Specification for Construction.

In order to be used in making the decision for the Retest and Appeal Process (section e.), QC samples shall be obtained using a random sampling procedure. Each test report associated with the sample must include an identifier to allow all test reports to be linked to a specific lot or subplot within the project. Non-random QC HMA (loose) samples can also be taken.

The Contractor shall maintain daily control charts and have them available for review at the plant at all times. Copies of these control charts shall be provided to the Engineer if requested. All test results shall be plotted and used in quality control decisions. When corrective action is necessary, the Contractor shall notify the Engineer in writing of the specific action taken. Failure to take corrective action as required will result in negative adjustment to the unit price for HMA as described in section (g) of this special provision.

1. **HMA (Loose) Gradation.** The Contractor shall test the mixture gradation for all sieve sizes reported on the JMF and plot them on a .45 power chart. This chart must clearly show control points and the restricted zone as these are defined in the Special Provision for Superpave HMA Mixtures included in this proposal.
 - A. The gradation shall be maintained within the control points. If the Contractor's test results for three consecutive single tests, or two consecutive running average of five values, on the same sieve are outside of the control points, the Contractor shall correct the gradation to maintain results within the control points and immediately notify the Engineer. If the corrections do not result in gradations inside the control points within the next three consecutive single tests, then production shall stop.
 - B. The gradation shall be maintained outside of the restricted zone as defined in the Special Provision for Superpave HMA Mixtures. If the Contractor's test results for three consecutive single tests on the same sieve, or two consecutive running average of five values on two consecutive sieves, fall within or pass through the restricted zone, the Contractor shall correct the gradation to maintain results outside the restricted zone and immediately notify the Engineer. If the corrections do not result in gradations outside the restricted zone within the next three consecutive single tests, then production shall stop.
 - C. If corrective actions result in a change to the aggregate blend proportions which accumulate to 10 percent or more from the original mix design submittal, a recalculation of the G_{sb} for VMA determination is required.

2. **HMA (Loose) Volumetrics.** If the difference between the established process quality control targets and the QC test results exceed the single test or running average of five tolerances shown in Table 1, the Contractor will immediately notify the Engineer, follow the QCP and necessary corrective action(s), if any, shall be implemented.

If the next QC test for that mixture again exceeds a QC tolerance, production shall stop and the Contractor shall immediately notify the Engineer. The Engineer will evaluate the Contractor's proposal for bringing production back into specification and either request further investigation or concur with the Contractor's proposal and allow production to restart.

d. Quality Assurance.

1. **Pavement Density.** The Engineer will identify 6 core sample locations for each lot based on longitudinal and transverse measurements. The Engineer will mark each core location with a two-inch diameter paint dot, which represents the center of the core. The Contractor shall drill a 6 inch core sample at each core location. The Contractor shall notify the Engineer sufficiently in advance of coring to ensure that MDOT has a representative to witness the coring operation and take immediate possession of the cores. The core samples shall be taken after final rolling and at the completion of a lot.

As an option, when mutually agreed to by the Engineer and Contractor, the core samples shall be taken prior to traffic staging changes, or at another time that is independent of paving operations. The Contractor shall provide traffic control as required in the special provision for maintaining traffic.

Cores shall not be taken within the segments, in which mixture sampling from behind the paver is conducted, hand patching areas or driveways. If the center of the core is less than 5 inches from either edge of pavement, select another transverse random number and move the core to the new location. Core samples shall not be damaged during removal from the roadway. If, for any reason, a core is damaged or determined not to be representative at the time of coring, the Engineer will evaluate and document the problem and determine if re-coring is necessary.

The minimum core thickness for each mixture type is:

HMA Mixture No.	Minimum Core Thickness
2	3 inch
3	2 1/4 inch
4	1½ inch
5	1 1/8 inch

Cores shall be measured at the time they are extracted from the pavement. Any core disqualified based on the minimum thickness criteria will be discarded and a new core location selected by the Engineer. If more than 50 percent of the cores in a lot are disqualified, production shall stop. Production will not be allowed to continue until the Engineer has confirmed that the paving operation is meeting the contract application rate. The Engineer shall take immediate possession of cores after they are removed from the pavement by the Contractor. The Engineer will maintain continual custody of the cores until they are tested.

All previous pavement, base aggregate, or bond coat material shall be sawed off the bottom of the core samples by the Engineer.

The Contractor will be allowed to take up to 6 informational cores per lot for quality control. These cores must be no closer than 2 feet center to center from the MDOT quality assurance (QA) core locations. The size of the Contractor's core must be 5 inches or less in diameter. Any additional informational cores will require the approval of the Engineer.

The core holes shall be filled with hot mixture, and thoroughly compacted as part of the coring operation. The method of filling holes and obtaining compaction shall be agreed upon prior to production.

Pavement density acceptance testing will be completed by the Engineer within four (4) working days after the Engineer has taken possession of the cores at the project site. Testing will be in accordance with ASTM D 2726. The Engineer's test results on the compacted HMA will be used as a basis of acceptance and payment.

2. **Plant Produced Material (Mixture) QA Sampling and Testing.** Location of QA sample sites within each subplot will be by a random process managed by the Engineer. Immediately after the Engineer acquires the samples, fill the voids with HMA.

The Engineer will sample the mixture in accordance with MTM 324, collecting two independent 20,000-gram samples at each sample site. These are the QA and appeal samples. The Engineer will assign an identifier to each sample consisting of contract ID, mixture, lot and subplot and deliver the samples to the MDOT Region HMA Laboratory where one 20,000-gram sample may be selected for testing and the other 20,000-gram sample will be retained for possible appeal testing.

One subplot sample will be randomly chosen for Department acceptance testing. If the test results are within the single test tolerance shown in Table 2, then the HMA will be accepted for the entire lot. If the test results exceed the tolerances of Table 2, then the remaining subplot samples will be tested. If the average of the test results meets the lot average tolerance of Table 2, then the HMA will be accepted for the lot. If these criteria are not satisfied, the HMA price adjustments detailed in section g. and Table 3 of this Special Provision will be applied.

Plant produced material acceptance testing will be completed by the Engineer within four calendar days after the completion of the lot. The Engineer will conduct the following tests.

- A. Maximum Specific Gravity, G_{mm} (MTM 314)
- B. Bulk Compacted Density, N_{max} (MTM 315)
- C. Air Voids, N_{ini}^* , N_{des} , N_{max}^* (AASHTO PP28-97) (* for information only)
- D. Voids in Mineral Aggregate, VMA (AASHTO PP28-97)
- E. Voids Filled with Asphalt, VFA* (AASHTO PP28-97) (*for information only)

F. Ratio of Fines to Effective Asphalt Binder*, $P_{\#200}/P_{be}$ (*for information only)

G. Composition of the Mixture- Asphalt binder content based on calculated value using subplot maximum specific gravity (G_{mm}) and current JMF effective specific gravity (G_{se}); the retained G_{mm} shall be used for gradation (ASTM C 136, C 117) and crushed particle content (MTM 117) from extracted (ASTM D 2172) or incinerated (MTM 319) aggregate, or from MTM 311.

- 3. Daily Asphalt Binder Certification Verification Samples.** Obtain the asphalt binder sample, correctly label the sample container, and complete a Sample Identification (Bituminous Material) (Form 1923B) dated (02/03). The form must be filled out correctly and completely, and signed before the sample is given to the Engineer. The daily asphalt binder sample must be taken from a sampling spigot located on the pipeline supplying asphalt binder to the plant, in a position between the asphalt binder pump and the point where the asphalt binder enters the mixture. Personnel safety is critical in selecting the position of the sampling spigot. Give the binder sample and completed Form 1923B to the Engineer.

Collect the daily asphalt binder sample in a one-pint (16 ounce), slip top, seamless ointment tin. The tin must be at least three quarters full. Three one-pint containers must be obtained if the binder being sampled has the "P" designation (e.g., PG 70-28P). One of these three containers must be marked with the letter "R", designating it as a referee sample. This is described in the Special Provision for Polymer Modified Performance Grade Binders included in the contract documents. All containers must be labeled in a legible format with the following information.

- MDOT control section and job number
- Binder grade
- Binder supplier certifier number
- Supplier name, city and state
- Date sampled
- Mix type

The Engineer may request to witness the sampling of the asphalt binder upon any visit to the HMA plant. The Engineer will complete the 1923B (02/03) form for the witness sample. The witness sample will become the daily asphalt binder sample of record. Any other binder sample taken that same day will be discarded.

The Engineer may request a copy of the MDOT Binder Certification Documents. These copies must be presented to the Engineer when the respective daily binder samples and 1923B (02/03) forms are picked up at the plant. The Engineer will review these documents and communicate any problems that may arise. The Engineer will deliver the certification documents to the MDOT C&T Central Laboratory.

e. Retest and Appeal Process for Plant Produced Material (Mixture). At the Engineer's request, the MDOT C&T Central Laboratory may perform appeal testing on all or part of the remaining subplot appeal samples. A request may be made by the Contractor to the Engineer to review the quality control test results and consider the quality control test results in determining if appeal testing is warranted. Quality control test results must be within the lot averages of

Table 2 to be considered. All appeal samples will be properly identified and sent to the MDOT C&T Central Central Laboratory for testing. Using the same test method option, the appeal sample will be tested for all QA parameters. All test data will be delivered to the Engineer. All appeal results will replace original QA test results.

f. Project Documentation. The format of all test reports and quality control charts to be submitted by the Contractor will be approved by the Engineer before mixture production is allowed to commence. Suggested formats of reports and charts are available from the Engineer. Project documentation to be provided by the Contractor shall include, but may not be limited to, the following.

1. **Lot Basis.** Control charts of all test data must be current (data should be plotted as soon as the test is complete) and available for review by the Engineer.
2. **Project Summation.** Control charts for all test data indicating individual test values, lot averages and the running average of five.

g. Measurement and Payment. Separate payment will not be made for providing and maintaining an effective hot mix asphalt quality control program as specified by this special provision. All costs associated with the work described in this special provision will be included in the applicable unit prices for the related HMA mixtures. HMA, (type) will be measured as specified in subsection 502.04 of the Standard Specification for Construction and the contract documents.

1. **HMA Mixture Unit Price Adjustment.** Adjustments to the contract unit price for **HMA** will be calculated for each of four sets of criteria. The largest adjustment allowable in each case will be imposed and unit price adjustments will be applied cumulatively (pavement density +HMA + failure to suspend operations) to the affected tonnage. Each of the unit price adjustments is detailed below.
 - A. Pavement Density - Based on pavement cores tested by the Engineer, either a 10 percent or a 25 percent adjustment in the **HMA Mixture** contract unit price may be imposed. The following criteria will be used and only the highest calculated pavement density price adjustment will be applied.
 - i. A negative 10 percent adjustment in the **HMA Mixture** contract unit price will be imposed if either the lot average pavement density is less than 92.0 percent but equal to or greater than 91.0 percent or the conditions of column (1) of the Pavement Density Core Table (Table 4) are satisfied.
 - ii. A negative 25 percent adjustment in the **HMA Mixture** contract unit price will be imposed if either the lot average pavement density is less than 91.0 percent but equal to or greater than 90.0 percent or the conditions of column (2) of the Pavement Density Core Table (Table 4) are satisfied.
 - B. Hot Mix Asphalt Mixture - If, for asphalt binder content, air voids, G_{mm} or VMA the difference between the lot average and the JMF is within the lot average tolerance shown in Table 2, no adjustment will be made to the unit price for **HMA Mixture** under this criteria.

If the lot average tolerance is exceeded for one or more parameter, a negative adjustment will be made to the contract unit price for **HMA Mixture** in accordance with Table 3. Only the largest of the four possible pay adjustments for this set of criteria will be assessed. This price adjustment is applied to the entire lot tonnage.

- C. Failure to Suspend Operations - If at any time during production, testing shows that a deviation has occurred which requires production to be suspended and the Contractor continues to operate, the subplot in production at the time shutdown should have occurred, and any subsequent tonnage, will be subject to a negative 25 percent unit price adjustment until testing shows that specification material is again being produced.
2. **Removal.** The cost of the mixture removed and the removal cost will be borne by the Contractor. Removal decisions will be applied to the entire lot.
- A. If, for other than the initial production lot of base course, pavement density for any lot (average of the 6 lot cores) is less than 90.0 percent, the Contractor shall remove and replace the lot.
- B. If the total contract unit price adjustment applied to a lot is 60 percent or more, the lot will be evaluated by the Engineer. If the Engineer determines that removal is warranted, the Contractor shall remove and replace the lot.
- C. The Engineer reserves the right to evaluate any lot whose test results for asphalt binder content, G_{mm} , VMA, or air voids, exceed the single test tolerances shown in Table 2. If the Engineer determines that the in-place mixture will not perform in accordance with normal standards the Contractor shall remove and replace the lot.

**Table 1: HMA Quality Control Testing Tolerances (+ or -)
From Process Quality Control Targets**

Parameter	Single Test	Running Average of Five
Air Voids	1.00%	0.50%
Voids in Mineral Aggregate (VMA) *	1.20%	0.60%
Maximum Specific Gravity (G_{mm}) *	0.019	0.010
Asphalt Binder Content *	0.50%	0.30%
Crushed Particle Content *	15.0%	10.0%
Aggregate Gradation *		
Sieve Size	Percent Passing	
No. 2.36 mm	5.00%	2.50%
No. 75 μ m	1.40%	0.70%
* Parameters with Target Values		

Table 2: HMA Quality Assurance Testing Tolerances (+ or -) from JMF

Parameter	Single Test	Lot Average
Air Voids	1.00%	0.60%
Voids in Mineral Aggregate (VMA) *	1.20%	0.75%**
Maximum Specific Gravity (Gmm) *	0.019	0.012
Asphalt Binder Content *	0.50%	0.35%
* Parameters with Target Values ** Or Less determined by VMA Value from the special provision for Superpave HMA Mixtures.		

Table 3: HMA Mixture Pay Adjustments

Parameter (lot average)	Deviation (d)	Negative Unit Price Adjustment (%)
Asphalt Binder Content (deviation from JMF)	0.35 < d ≤ 0.55 d > 0.55	10 25
Air Voids (deviation from JMF)	0.6 < d ≤ 0.7 0.7 < d ≤ 0.8 0.8 < d ≤ 1.0 1.0 < d ≤ 1.1 1.1 < d ≤ 1.2 d > 1.2	2 4 6 8 10 25
Maximum Specific Gravity (Gmm) (deviation from JMF)	0.012 < d ≤ 0.014 0.014 < d ≤ 0.015 0.015 < d ≤ 0.017 0.017 < d ≤ 0.019 0.019 < d ≤ 0.021 d > 0.021	2 4 6 8 10 25
Voids in Mineral Aggregate (VMA) (deviation below minimum value found in the Special Provision for Superpave Hot Mixed Asphalt Mixtures)	0.0 < d ≤ 0.1 0.1 < d ≤ 0.3 0.3 < d ≤ 0.4 0.4 < d ≤ 0.5 0.5 < d ≤ 0.6 d > 0.6	2 4 6 8 10 25

Table 4: Pavement Density Core Table

Total Number of Cores Tested	Minimum Number of Cores Less Than 92.0% * COLUMN 1 (-10%)	Minimum Number of Cores Less Than 91.0% * COLUMN 2 (-25%)
3	2	2
4	2	2
5	2	2
6	3	2
7	3	2
8	3	2
9	3	2
10	3	3
11	4	3
12	4	3
13	4	3
14	4	3
15	4	4
16	5	4
17	5	4
18	5	4
19	5	4
20	5	5